Nuclear Proliferation via Darknet Markets

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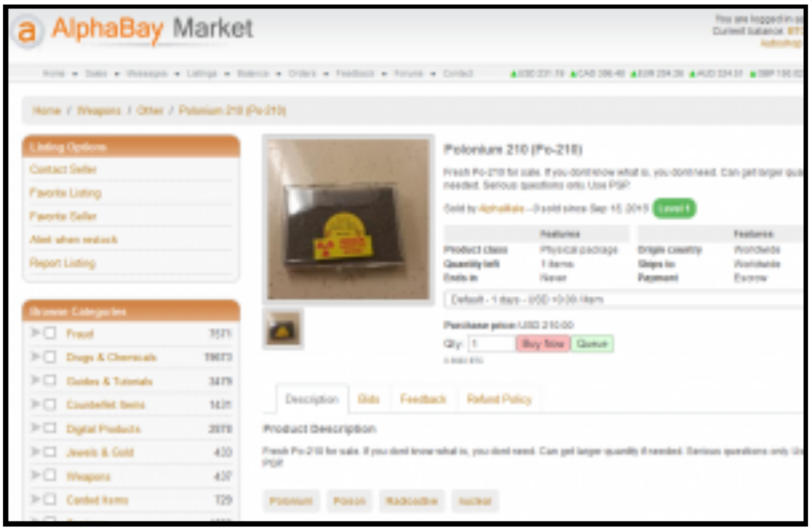
If there was a website where you could buy cocaine, AK47s, tasers, guides to stealing and hacking, or fake American passports, why wouldn't you be able to buy something worse? What would stop the site from selling you the kit you would need to go nuclear?



Polonium 210 (Po-210)

Fresh Po-210 for sale. If you dont know what is, you dont need. Can get larger quantity if needed. Serious questions only. Use PGP.

	Features		Features
Product class	Physical package	Origin country	Worldwide
Quantity left	1 items	Ships to	Worldwide
Ends in	Never	Payment	Escrow

Purchase price: USD 210.00

Product Description

Fresh Po-210 for sale. If you dont know what is, you dont need. Can get larger quantity if needed. Serious questions only. Use PGP

Micro Curie Polonium-210 Source from AlphaBay

Since 2014 work has highlighted the problem posed by ecommerce to nuclear [here at ICSA and by our colleagues at project alpha] and biological export control regimes. A wide variety of export controlled items from the Nuclear Suppliers Group lists, that control the goods you would need to build a nuclear weapon, were found to be freely available on ecommerce sites such as *Alibaba.com*. Significantly, these analyses did not include the darknet markets, notorious platforms used for the exchange of illegal goods.

After Silk Road

Since the takedown of *Silk Road 2.0* by the FBI in 2013 darknet markets, sometimes known as cryptomarkets, have continued to operate. Since the death of the *Silk Road* brand, which was estimated at the time of its closure be making 92,000 USD a month for its operators, no single site has dominated traffic and as of December 2015 there are over 20 filling *Silk Road*'s gap in the market. No site currently in operation was online before December 2013, highlighting the nature of the cat-and-mouse game being played out between the markets and the authorities. Analyses of the contents and users of these markets in the past have focused on drugs and conventional criminal activity, such as hacking and fraud, with no analysis yet performed on export controlled equipment and materials. In a recent excellent analysis by another group of colleagues at King's which took a broad look at darknet content, included work on classifying darknet sites.

Cryptomarkets operate on a part of the internet known as the darknet, which is also sometimes known as hidden services. To access this part of the web anonymising software such as the *TOR* browser is required, which effectively masks the user's IP address by relaying it through a series of proxies. This allows users to reach sites with the .onion extension. The darknet is not indexed on search engines such as *Google* and to access sites the link must be known. Fortunately, for a researcher at least, darknet markets want customers, so they make themselves very easy to find. Many markets have their own page on reddit (subreddit) and a quick google search for darknet markets will provide a list of currently operating sites. Of course, the majority of darknet sites are better-hidden.

Anonymity is King

The darknet markets themselves place a strong emphasis on anonymity of their users. There is no state to police product quality or enforce any agreements. Sites therefore focus on mechanisms to reduce insecurity in online transactions. Financial transactions use cryptocurrencies such as *bitcoin,* which can be bought using regular currency though a bitcoin exchange site. Many cryptocurrencies are available but bitcoin is the only one currently accepted by all sites. These currencies allow financial transactions that are difficult to trace by other users or the authorities. All bitcoin transactions are recorded in the blockchain, a public file stored on multiple systems, allowing the flow of bitcoins to be followed and acts as the currency transaction verification mechanism. The blockchain does not record who is performing what transaction, and each transaction is linked to a random online address, but discovering an identity at any stage along the chain would quickly compromise a user's anonymity. For this reason most darknet market users send their bitcoins to 'mixers' that return the same quantity of bitcoins as sent, but blended between many users.

To avoid sellers not sending orders, sites also use the 'escrow' system where transactions proceed via an intermediary, usually a site administrator, which holds the money from transactions until items are verified as delivered by the buyer. In the case of disagreements the marketplace administrator would then resolve the dispute. In the first generation of darknet markets the site itself held the money (a system also commonly used on regular B2B sites). Scammers quickly found a way to exploit this leading to whole sites designed to steal all their users' bitcoins. The markets that attract the most traffic today are those that use the most up-to-date user protections – namely 'multisig escrow'. In this system a virtual bitcoin wallet is created. The buyer then inserts their funds and the funds are only released to the seller when two of the three between buyer, seller and marketplace administrator agree.

Just like Amazon sellers or eBay

A system of feedback is also crucial to the operation of the sites. Sellers with no feedback are not as trusted as those with multiple reports of good feedback, much like sellers on amazon and Ebay. Some sites allow private listings, where sellers' products are not linked through the main site. This allows a trusted seller to sell only to a known customer base. This is perhaps useful to maintain an established buyer-seller relationship when the customers buy the entirety of the supply. This means these transactions cannot be monitored by outside observers. When trying to monitor the availability of export controlled goods this is a problem, but similar products are still likely to be sold on the public part of the site, or would have had to have appeared there in the past.

Delivery of physical goods is performed using normal postal services. Sellers use 'stealth' – techniques designed to hide the true nature of the shipment from the authorities. The only part of a transaction that can be linked to a person, the shipping address, is exchanged via encrypted messenger software, the industry standard at the moment being PGP, or 'Pretty Good Privacy', a public-private key encryption system. Using this, the seller is the only one able to decrypt the buyer's address, after an exchange of public keys. This messaging system is also used for all communication between users and vendors on the sites. The buyer has to somehow pick up the package and at this point there is only so much that can be done to protect anonymity, so methods such as the use of a P.O. box are the buyer's last line of defense.

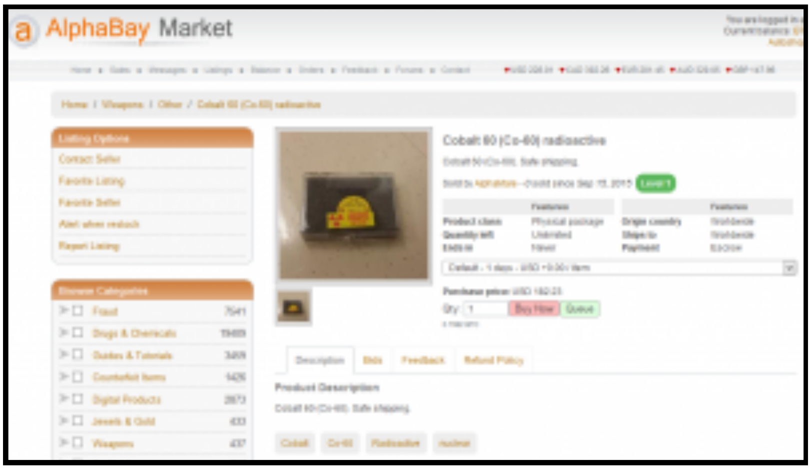
So what is on there?

A priori, darknet markets seem like an ideal place for illicit trade for export controlled items. Small numbers of items for use in the nuclear fuel cycle, such as pressure transducers, would be easy to offer and relatively easy to buy anonymously. The money trail using darknet markets would be hard to follow with the use of cryptocurrency for the transaction. Shipping could also be performed with 'stealth' where the items are cleverly disguised from customs officials. Failing this, potential nuclear buyers and sellers could also make first contact on a darknet market and then continue to communicate through encrypted channels.

Yet in the first search for nuclear goods on darknet markets that we are aware of, across all the darknet markets that were operating in October 2015, no trace of any nuclear-fuel cycle related items was found. Drugs were copious and an array of items – guides to stealing credit cards, lifetime Netflix memberships, fake passports, fake driving licenses, CS gas, lists of darknet sites, the anarchist's cookbook and the complete works of G. R. R. Martin – not a single item even close to being relevant for nuclear export controls was found.

Nuclear Security Questions

Seemingly the only exception was a seller from the *Alpha Bay* market in Autumn 2015 offering Polonium-210, Cobalt-60, at micro-curies activity levels, likely stocked from a lab supplies company.



AlphaBay Market

Home / Weapons / Other / Cobalt 60 (Co-60) radioactive

Listing Options
- Contact Seller
- Favorite Listing
- Favorite Seller
- Alert when restock
- Report Listing

Browse Categories

Fraud	7541
Drugs & Chemicals	19489
Guides & Tutorials	3459
Counterfeit Items	1426
Digital Products	2873
Jewels & Gold	433
Weapons	437

Cobalt 60 (Co-60) radioactive

Cobalt 60 (Co-60). Safe shipping.

Sold by AlphaMale - 0 sold since Sep 15, 2015 Level 1

	Features		Features
Product class	Physical package	Origin country	Worldwide
Quantity left	Unlimited	Ships to	Worldwide
Ends in	Never	Payment	Escrow

Default - 1 days - USD +0.00 / item

Purchase price: USD 182.23

Qty: 1 Buy Now Queue

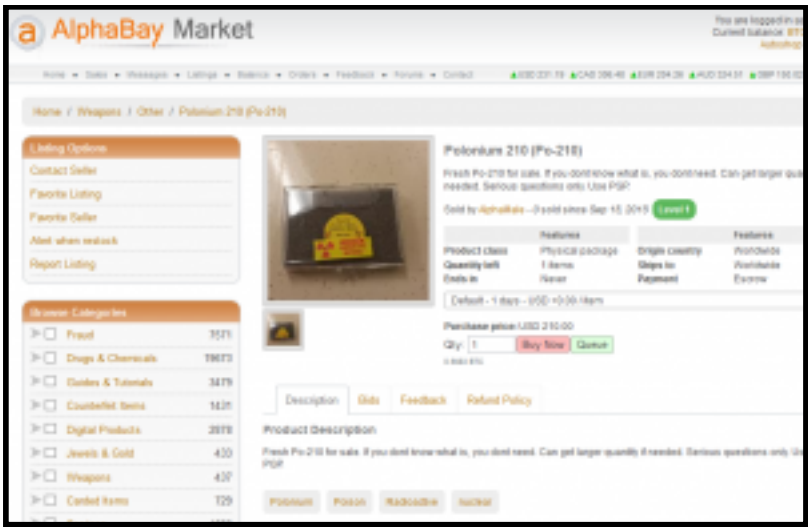
Description Bids Feedback Refund Policy

Product Description

Cobalt 60 (Co-60). Safe shipping.

Cobalt Co-60 Radioactive nuclear

1 micro Curie Cobalt-60 source from AlphaBay market



AlphaBay Market

Home / Weapons / Other / Polonium 210 (Po-210)

Listing Options
- Contact Seller
- Favorite Listing
- Favorite Seller
- Alert when restock
- Report Listing

Browse Categories

Fraud	7571
Drugs & Chemicals	19673
Guides & Tutorials	3479
Counterfeit Items	1431
Digital Products	2878
Jewels & Gold	430
Weapons	437
Carded Items	729

Polonium 210 (Po-210)

Fresh Po-210 for sale. If you dont know what is, you dont need. Can get larger quantity if needed. Serious questions only. Use PGP.

Sold by AlphaMale - 0 sold since Sep 15, 2015 Level 1

	Features		Features
Product class	Physical package	Origin country	Worldwide
Quantity left	1 items	Ships to	Worldwide
Ends in	Never	Payment	Escrow

Default - 1 days - USD +0.00 / item

Purchase price: USD 210.00

Qty: 1 Buy Now Queue

Description Bids Feedback Refund Policy

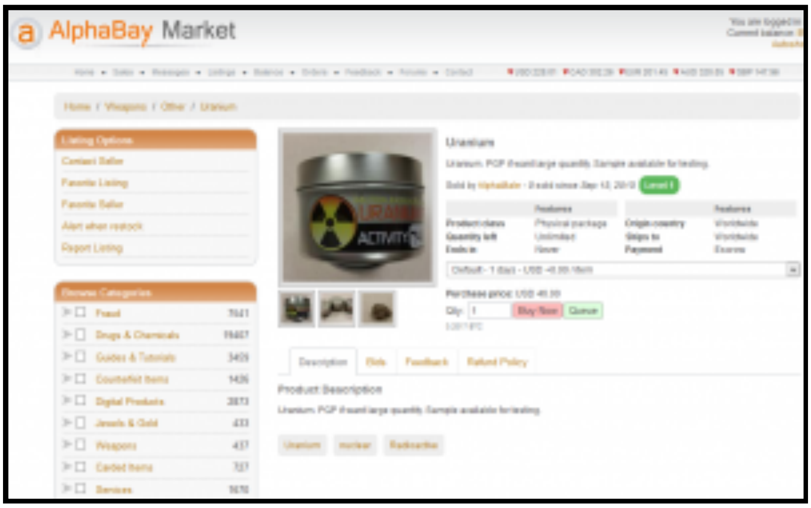
Product Description

Fresh Po-210 for sale. If you dont know what is, you dont need. Can get larger quantity if needed. Serious questions only. Use PGP

Polonium Poison Radioactive nuclear

0.1 micro Curie Polonium-210 Source from AlphaBay

They also sold tiny quantities of uranium; thankfully it was the kind that you can also buy on amazon.



AlphaBay Market

Home / Weapons / Other / Uranium

Listing Options
- Contact Seller
- Favorite Listing
- Favorite Seller
- Alert when restock
- Report Listing

Browse Categories

Fraud	7541
Drugs & Chemicals	19487
Guides & Tutorials	3459
Counterfeit Items	1426
Digital Products	2873
Jewels & Gold	433
Weapons	437
Carded Items	737
Services	[illegible]

Uranium

Uranium. PGP if want large quantity. Sample available for testing.

Sold by AlphaMale - 0 sold since Sep 15, 2015 Level 1

	Features		Features
Product class	Physical package	Origin country	Worldwide
Quantity left	Unlimited	Ships to	Worldwide
Ends in	Never	Payment	Escrow

Default - 1 days - USD +0.00 / item

Purchase price: USD 41.[illegible]

Qty: 1 Buy Now Queue

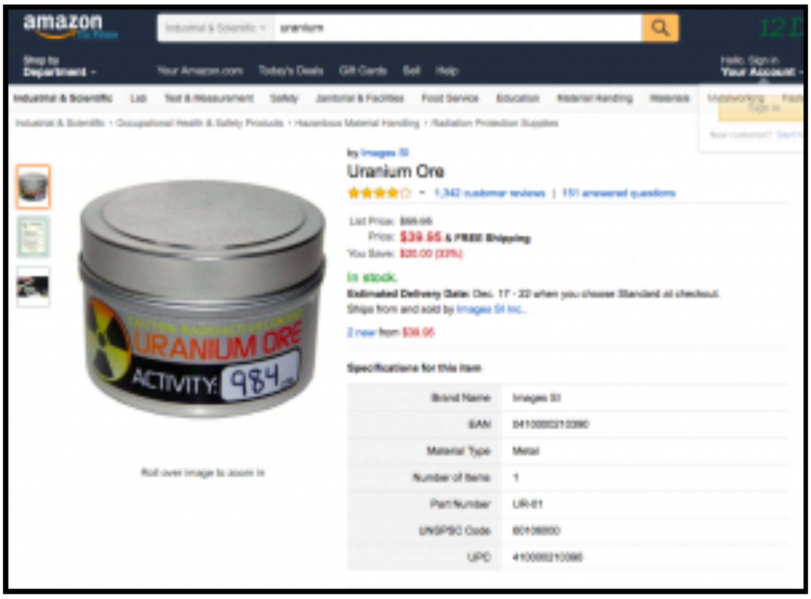
Description Bids Feedback Refund Policy

Product Description

Uranium. PGP if want large quantity. Sample available for testing.

Uranium nuclear Radioactive

Uranium ore on AlphaBay (from Autumn 2015)



by Images SI

Price: $39.95 & FREE Shipping

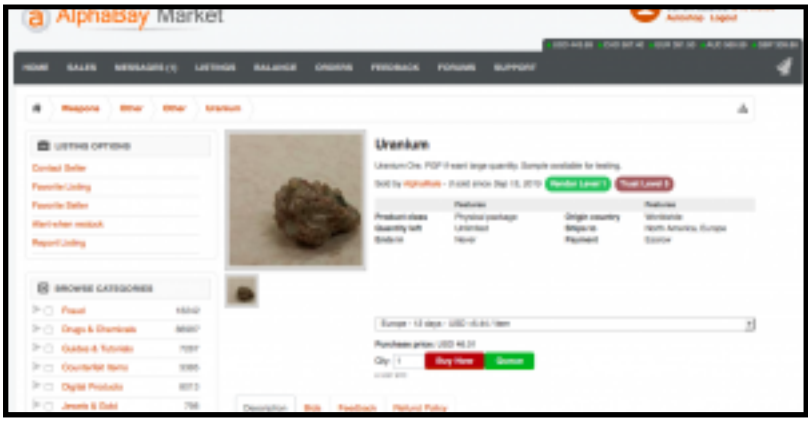
In stock.

Specifications for this item

Brand Name	Images SI
EAN	[illegible]
Material Type	Metal
Number of Items	1
Part Number	UR-01
UNSPSC Code	[illegible]
UPC	[illegible]

Uranium ore on Amazon

As of April 2016 the seller is still there (easy to check using *Grams*, the darknet markets' search engine at http://grams7enufi7jmdl.onion with *TOR*) offering uranium, 0.1 µCi Co-60, as well as chemical hazard suits, radiation signs, but no more polonium. He has even had 4 customers.



Uranium ore on AlphaBay (from April 2016)

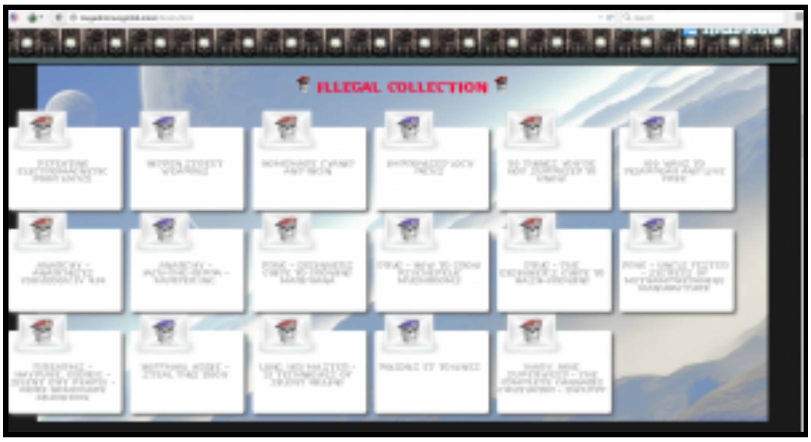
How seriously should the availability of these items be taken? The radiation levels are minuscule. Polonium-210 is used as a neutron initiator in a nuclear weapon, but probably 1,000-1,000,000 times more would be needed. It was also used in the assassination of Alexander Litvinenko, but again a much larger quantity would probably needed, given that the micro-curie amount was priced at $210 dollars, you can get it from suppliers for a similar price, and reports around the incident claimed that it would likely have cost ‘tens of millions of dollars’. A look at the radiation dose delivered by this 0.1 µC sample would lead us to the same conclusion.

So we are left with the likelihood that our seller is a prankster or FBI agent. Even so, that these kinds of items were even available raises important nuclear security questions about the darknet that should be addressed in future.

Other Interesting activity

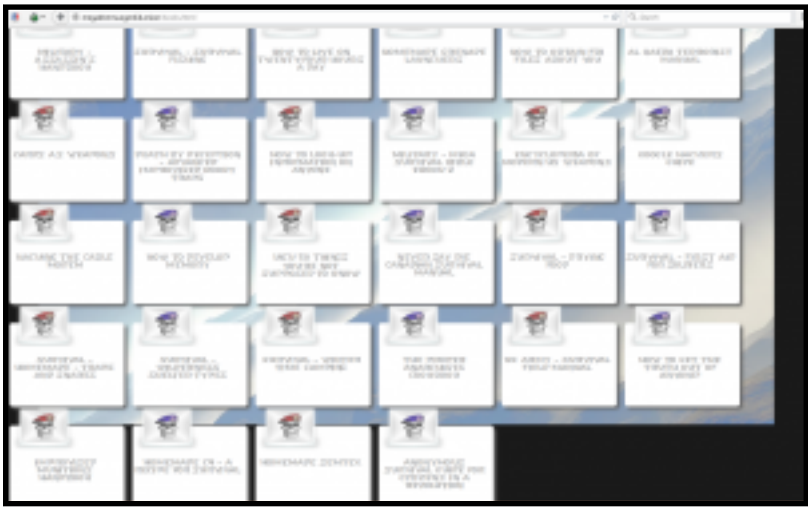
Other items to raise eyebrows include designs for 3D printed weapons, some concerning books, and weapons.

Post for Liberator 3D printed gun design

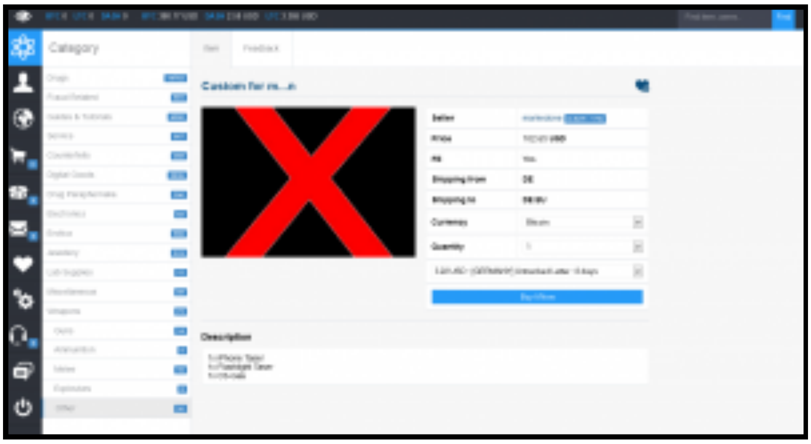


'Illegal' Books available on darknet markets

Weapon-related books on darknet markets



Custom weapons order



Seller

Price USD

Shipping from DE

Shipping to

Currency

Quantity

Custom weapons order 2

Why is there nothing on the NSG lists?

The original purpose of the study however, was to look at the darknet as a place to procure items for use in the nuclear fuel cycle. How is it possible to explain that not a single item across all the darknet markets was found that would be considered relevant to the nuclear fuel cycle? This should be considered in stark contrast to the nuclear cornucopia available on the biggest business-to-business markets, which sit inside an accountable legal framework of recorded transactions and deliveries.

One possible reason is the logistics of shipping small quantities. Drugs, the most commonly sold products, are vacuum packed to hide the smell from sniffer dogs and then concealed as innocuous items to further confound the authorities. Much of this trade may be domestic, and for small quantities of drugs would probably fit through a letterbox. Shipping large quantities of items, such as those required for a nuclear industrial programme are much harder to conceal. For transnational shipping the items are exported and are likely to come under more scrutiny than domestic packaging. It does not seem that sellers on the darknet markets are going to the more extreme measures required for shipping in large quantities by traditional transnational organised crime.

However, an alternative explanation is the customer base. These sites have been described as more than just marketplaces, but spaces where drug use is not demonised and where there is freedom of association, freedom of consumption and production. The sites have been described as a constructed realisation of the designers' libertarian values and this was reflected in discussions on the forums of libertarian philosophy, online personal security and drug use. This culture persisted in the mid 2000s when the software required to access the dark net was more obscure and the sites were populated with 'cyber junkies'. Since markets have attracted both greater interest from policing and a lower barrier to entry (i.e. the ease of downloading *TOR*) this has shifted the makeup of the community. A market exists for drugs, low-level cybercrime (such as hacking and stealing credit card information) and some weapons, but selling high-strength carbon fibre or corrosion resistant pressure transducers does not fit with the clientele of the markets. For sites that cater almost exclusively to drug users, how would a seller, without using another medium, convince any potential buyer to visit a darknet market in the first place or believe that any product offered was not a sting?

Some markets go as far as to ban weapons, (some even explicitly ban WMD), pornography, or anything other than drugs in their terms of use. This appears to be a community that is mostly interested in trading drugs. If nuclear fuel cycle-related smuggling is occurring on the darknet then it is on the truly hidden part that receives much less traffic. A short-term study may have missed sales that happened in previous months and years, but at the very worst this would mean an illicit trade in nuclear-fuel cycle related goods is occurring on the darknet markets very infrequently. No obvious category even exists on any currently operating market from which to sell nuclear-fuel cycle related goods. Sites tend to follow the same model as Silk Road with a large 'drugs' section and other categories such as 'digital goods', 'erotica', and 'weapons'. No category such as machinery or industrial supplies exists to even hint at this kind of trade occurring.

Of course, with the apparent freedom of availability through legitimate ecommerce platforms why would somebody trying to buy an item for a nuclear programme go to the darknet in the first place? A secure encrypted communication channel would be used as soon as a complicit supplier is found.

Of course, as noted above, fellow researchers at King's have looked much deeper into the darknet. It is likely that all the markets but one in this work would be classified as 'drugs'. Many possible sites with relevance to nuclear non-proliferation and nuclear security have yet to be researched in detail in the open literature.

What the future may hold

Nevertheless, the role of darknet markets may change in the future. Crackdowns on legal ecommerce may cause items to be harder to find through surface-web ecommerce. Then alternative darknet markets could spring up with a different focus and customer base – although the Silk Road sister site for weapons, *The Armory,* reportedly closed in 2012 due to lack of business. As noted, there are well-hidden parts of the darknet where illicit industrial may be already happening. However, the clear web could see more widespread use of cryptocurrencies. In addition, there is also a trend towards increased use of encryption software amongst ordinary internet users. International arms smugglers are likely to make use of this kind of technology if teens are adopting it wholesale. These changes could introduce further challenges to export control regimes.